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Personality traits and mental disorders

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The hypothesis that personality and mental health are linked together is very old. Ancient Greeks, Hippocrates and Galen, theorized that four humors explain personality types and specific health problems. Ever since these early speculations there has been a wide interest on the topic, and a number of theoretical models have been proposed to explain the association between personality and health, including mental disorders. To date, a number of systematic meta-analysis (Gomez & Corr, 2014; Jeronimus, Kotov, Riese, & Ormel, 2016; Kotov, Gamez, Schmidt, & Watson, 2010b; Malouff, Thorsteinsson, & Schutte, 2005; Ohi et al., 2016; Ormel et al., 2013), and narrative reviews (Andersen & Bienvenu, 2011; Klein, Kotov, & Bufferd, 2011; T. Widiger, 2011; T. Widiger & Smith, 2008) have been published on the topic.

In this chapter, we describe major theoretical frameworks on personality and mental disorders, and review the empirical evidence for these models by different mental health outcomes. Due to high number of publications on the field, we concentrate primarily on published meta-analyses and theoretical reviews. After that we discuss some of the key problems in the literature and highlight ideas for further research. We conclude this chapter by discussing practical implications of this line of research.

What is personality?

Personality is an umbrella term referring to a large number of variables at different levels of personality functioning. Currently, a three-level description of personality functioning has gained much scientific support (McAdams & Pals, 2006). At the first level are personality traits, which are a comprehensive description of individuals differences in patterns of thoughts, feelings and behaviors (*for more details, see chapters 2 and 9 in this book*). Characteristic adaptions at the second level describe motivational and social-cognitive details of personality functioning. Life narratives at the third level describes an idiographic and constantly evolving life story. From these three levels, we focus on personality traits as most of the research conducted of the topic has

focused on them. This, however, does not mean that other levels of personality functioning would not be of importance. On the contrary – it is likely that effects of personality traits on mental health are also reflected at the other levels of personality functioning. For example, a diagnosis of major depressive disorder (MDD) or schizophrenia is likely to have a major influence on motivational aspects of personality as well as life narrative of an individual. Research in this field is, however, currently still emerging (Adler et al., 2015).

From the different models of personality traits, the Five-factor model of personality (i.e., Big Five) has attracted substantial research attention. It includes five personality traits, extraversion, neuroticism, agreeableness, conscientiousness and openness to experience. The Big Five is currently the most widely used theory of personality traits (Digman, 1990; John, Naumann, & Soto, 2008), although the traits neuroticism and extraversion have also been included in other trait-theories before the Big Five (Digman, 1990) and thus most of the published studies have concentrated on these two traits. As the Big Five personality model is described in great detail elsewhere in this volume (*see chapter 9 in this book),* we summarize the key features of these traits here only briefly.

Individuals high on the *neuroticism* scale tend to be worrying, impulsive and experience more distress than others. *Extraversion* is defined as a tendency to be sociable and warm, and extraverted individuals prefer the company of others to being alone. Characteristics of *openness* are originality, independence, and intellectual curiosity. *Conscientiousness* is described as a tendency to be well organized, reliable, and persevering, and persons high on the conscientiousness scale are thought to be more capable of self-discipline than others. *Agreeableness* is characterized as a tendency to be sympathetic and forgiving, and an agreeable person usually trusts others.

Classification of mental disorders

Research on personality and mental health has always been related to the development of classification systems. The need for a comprehensive classification system for mental disorders has been apparent for nearly a century. The Diagnostic and Statistical Manual of Mental Disorders (DSM) in 1952, and later DSM-II in 1968, were among the first efforts to classify mental disorders in a systematic way. However, a clear breakthrough in producing a more comprehensive picture of psychiatric classification and pushing the field forward occurred when the DSM-III was published in 1980 (Wilson, 1993). Later revisions, DSM–III–R (APA, 1987) and DSM–IV (APA, 1994), made incremental improvements to the system but maintained the basic framework and focus of the DSM–III.

Another widely used psychiatric taxonomy is the International Classification of Diseases (ICD) published by the World Health Organization (WHO). This classification covers physical illnesses. Mental disorders were first included in the sixth version of the ICD-6, published in 1949, and more comprehensive definitions were provided in the ICD-8, published in 1974. Although there was some collaboration between the developers of the early ICD and DSM versions, concerted efforts have only been made in recent decades to align the ICD and DSM. The 10th edition of the international manual (ICD–10; World Health Organization, 1992) corresponds closely with the DSM–IV. Thus, the modern approach to the diagnosis of mental illness is now established across the world.

The chief achievement of these approaches is the uniformity of diagnostic practices that resulted from improved reliability and widespread acceptance of the manuals. However, operational criteria of the DSM-IV have become the standard in mental health research, whereas ICD-10 are more commonly used in the everyday clinical work (Reed, Correia, Esparza, Saxena, & Maj, 2011). For a detailed review of the development of DSM and ICD classification systems, please see: (Clark, Cuthbert, Lewis-Fernández, Narrow, & Reed, 2017).

However, the current psychiatric classification systems are not without problems. Starting from the DSM-III, mental disorders have been categorized using a specific list of observable signs, self-reported symptoms, and by several types of specific thresholds, such as number of signs and symptoms, an approach that has attracted criticism for a number of reasons. First, it is unclear whether mental disorders are better represented by categories or dimensions. Although current evidence points out that in many mental disorders, such as mood and anxiety disorders, dimensions describe mental disorders better than categories (Haslam, Holland, & Kuppens, 2012), there is a lack of comprehensive dimensional models of mental disorders. In addition, categorization is seen as essential for communication and clinical decision making, and at the moment all current versions of DSM and ICD have followed categorical models. Second, comorbidity is a major problem for diagnostic taxonomies. It has been demonstrated in a wide number of studies that individuals diagnosed with one mental disorder have increased odds of meeting the criteria for at least one other disorder, and many individuals can meet the diagnostic criteria for three or more disorders. This high co-occurrence of mental disorders can be seen as evidence that existing classification to do not adequately classify mental disorders. In addition, it also points out that in many instances the nature of mental disorders is not very well understood.

Although classification taxonomies are not often updated, at the moment, the revision of ICD is on-going and proposals for ICD-11 have suggested that for certain disorders, mainly personality disorders, depressive disorders, and psychotic disorders, a dimensional model could be – at least partly – adapted. In addition, the US National Institute of Mental Health has introduced a Research Domain Criteria Initiative (RDoC) (Cuthbert & Insel, 2013), which proposes that future research should be targeted across broad domains that reflect impaired brain functioning and that it should incorporate a strong translational perspective where analysis is targeted at the dimensional level of mental disorders.

In addition to these developments, new theoretical models of mental disorders are likely to contribute to our understanding of mental disorders. The theory of the general factor of psychopathology, also known as *p* factor, postulates that a general latent factor explains most of the variance across different mental disorders (Caspi et al., 2014; Lahey et al., 2012). It has been argued that *p* factor could represent a useful way of studying mental disorders, because it reflects the comorbid and "hidden" dimensionality of mental disorders. Up to date, higher p factor scores have been associated with a greater number of etiological factors as well as increased social and cognitive problems in later life (Caspi et al., 2014), indicating the potential usefulness of the p factor concept. More recently, a new classification system for mental disorders, the Hierarchical Taxonomy of Psychopathology (HiTOP) (Kotov et al., 2017), which incorporates many of dimensional models of psychopathology, was introduced. HiTOP postulates that, first there are extremely broad dimensions, such as the p factor, which describe vulnerability to all mental disorders. After this, there are three broad domains of internalizing, externalizing, and thought disorder, describing vulnerability to more specific patterns of abnormal feelings and behavior. After these broad domains, another five, more specific, domains (detachment, antagonistic externalizing, disinhibited externalizing, thought disorder, and internalizing) are seen to describe different core symptoms of mental disorders. Interestingly, the HiTOP dimensional model of psychopathology suggest that personality provides a foundation base for the whole model (T. A. Widiger et al., 2018), indicating that personality provides a general structural framework for psychopathology. However, although p factor and HiTOP are based on a growing number of individual studies and integrating previous research together, usefulness of these models require more research on the topic.

Theoretical models explaining the association between personality and mental disorders

A number of theoretical models have been proposed to explain the association between personality and mental disorders, in particularly that between neuroticism and depression (Klein et al., 2011; Ormel et al., 2013), but also those between other personality depression traits and mental disorders in general. These models are listed in **Table 1** and described here briefly.

The *Vulnerability model* postulates that personality traits represent a risk or protective factor for the onset of mental disorder. For example, high neuroticism could either cause the development of mental disorder or enhance the impact of other mental risk factors, such as stressful live events. Evidence on prospective associations between personality traits and mental disorders after adjustment for baseline mental disorder or symptoms is seen as a necessary condition for the validity of the vulnerability model.

The *Common cause* model posits that common determinants explain the association between personality traits and mental disorders. According to this model, there is no direct relationship between personality and mental disorders, rather a third variable explain the association between them. Findings where, for example genetic or environmental factors, would be associated with both personality and mental disorders would provide support for the Common cause model.

In some theoretical models, a common cause is suggested to explain part of the correlation between personality and mental disorders while specific factors help to explain how the manifestations of the common cause may diverge into different types of mental disorders. The *tripartite model* of anxiety and depression has been in a major role explaining the role of personality in depression and anxiety disorders (Clark & Watson, 1991). Originally, the tripartite model postulated that both anxiety and depression are characterized by high levels of negative affect (neuroticism). In addition, they distinguished from each other by two specific factors: positive affect (extraversion), which is low in depressive disorders, and hyperarousal, which was high in anxiety disorders.

The *Spectrum model*, also known as the Continuum model, postulates that certain personality traits and mental disorders are different manifestations of the same underlying processes. A good example of this is neuroticism and depression, where a diagnosis of depression is seen to identify those individuals who have highest scores on neuroticism. In addition, in the spectrum model the association between personality traits and mental disorders is hypothesized to be fairly specific and also non-linear, which indicated that nobody under threshold in a certain personality trait will receive a diagnosis. The *Scar model* postulates that the direction of causation flows from mental disorders to personality, that is, that mental disorders cause persistent changes in personality traits. The *State model* is similar to the Scar model but suggests that changes in personality traits are only temporary.

In addition to these models, recently Durbin & Hicks (2014) proposed a new model – co-development model where the Vulnerability and Common causes models are incorporated to describe personality development over the life course (Durbin & Hicks, 2014). This Co-development model also postulates that the personality traits are dynamically associated with mental disorders and that these associations can differ at different life point or environment (Durbin & Hicks, 2014). An example of this kind of dynamic relationship is the association between personality traits, life-events and mental-disorders, where a reciprocal relationship has been demonstrated (Spinhoven et al., 2011).

Evidence on associations between personality traits and mental disorders

Hundreds of studies have been conducted where the association between personality traits and mental disorders have been examined (Gomez & Corr, 2014; Kotov, Gamez, Schmidt, & Watson, 2010a; Malouff et al., 2005). Whereas the main focus of these studies has often been on the role of personality in depressive disorders, there is also a wide literature on the relation between personality with anxiety, substance abuse, schizophrenia and other psychoses. Although a majority

of these studies have been cross-sectional, there is an increasing number of studies with several follow-ups where the dynamic relationship between personality and mental disorders have been examined.

Depression and anxiety disorders

In a comprehensive meta-analysis of the five factor model of personality with depressive and anxiety disorders, Kotov and colleagues (Kotov et al., 2010b) combined 175 studies published between 1980 and 2007. Their results showed that individuals with depressive disorder had high neuroticism (mean correlation coefficient[r] range between 0.36 to 0.49) and low conscientiousness (mean r range between -0.27 to -0.30), and that also individuals with anxiety disorder had high neuroticism (mean r range between 0.28 to 0.45) and low conscientiousness (mean r range between -0.16 to -0.34). In addition, individuals with depressive or anxiety disorder had lowered levels of extraversion (for depressive disorders mean r between -0.18 to -0.29; for anxiety disorders mean r between -0.07 to -0.37). The two other major personality traits, agreeableness and openness to experience, were not associated with depressive or anxiety disorders (Kotov et al., 2010b). Although there were some differences in the strength of the associations between diagnostic groups, these differences were generally quite small. Taken together, strongest effect sizes are found for high neuroticism, which has been consistently associated with all depressive and anxiety disorders.

Jeronimus and his colleagues (Jeronimus et al., 2016) examined the prospective associations between neuroticism with mental disorders and their meta-analysis included 59 longitudinal studies with nearly 450 000 participants. In their study neuroticism was associated with future anxiety or depression diagnosis with a moderate effect (Cohen's d around 0.50). An association with substance abuse was also found, but the effect size was considerable weaker (Cohen's D = 0.20). Interestingly, adjustment for baseline mental disorders reduced the effects sizes around 50% for anxiety and depression disorders, but not for substance abuse disorder. Moreover,

prospective associations were considerably larger over short than long follow-up intervals when adjustment for baseline mental disorders were not done. However, when baseline symptoms were adjusted, the effect sizes were only slightly larger. Interestingly, there is also some evidence that neuroticism is differently associated with subtypes of depression.

Khazanov and Ruscio (Khazanov & Ruscio, 2016) examined in their meta-analysis the prospective association between positive emotionality – an umbrella term that includes extraversion, positive affect and behavioral activation – with depression and anxiety symptoms. Although low extraversion was associated with both depression (mean r = -0.26) and anxiety (mean r = -19), these associations diluted considerable when baseline depression or anxiety were controlled. In addition, low extraversion predicted changes in depression and vice-versa (Khazanov & Ruscio, 2016), indicating that extraversion could explain the course of depression. This finding is in line with evidence from a longitudinal cohort study, where individuals with chronic depression had lower levels of extraversion when compared to individuals with non-chronic depression (Wiersma et al., 2011). However, it seems that the association between extraversion and depression might considerable weaken after neuroticism is controlled (Kendler, Gatz, Gardner, & Pedersen, 2006).

We are not aware of meta-analyses of prospective associations between the three other Big Five personality traits and depression and anxiety disorders, and there is also a lack of large scale longitudinal cohort studies conducted on the topic. However, there is some preliminary evidence that baseline high conscientiousness could be associated with better outcomes and lesser comorbidity of depression and anxiety over time (Anderson & Mclean, 1997; Spinhoven, De Rooij, Heiser, Smit, & Penninx, 2012), indicating that high conscientiousness could affect the course of depression or anxiety disorder.

In addition to clinical studies where patients with mental disorders and healthy controls have been examined, there are a number of survey studies that have examined the

association between Big Five personality traits and depressive symptoms. In a recent individual-participant meta-analysis by Hakulinen and colleagues (Hakulinen, Elovainio, Pulkki-Råback, et al., 2015), longitudinal prospective cohort studies with over a total of 50 000 participants were pooled together. In this study, high neuroticism, low extraversion and low conscientiousness were associated with higher levels of depressive symptoms in the cross-sectional analyses and also in the longitudinal analyses where baseline symptoms were taken into account. In addition to these findings, depressive symptoms predicted change in personality traits; depressive symptoms were associated with personality change in extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience (Hakulinen, Elovainio, Pulkki-Råback, et al., 2015). Other studies have also shown that the association between personality and at least with depression symptoms is partly reciprocal. In a sample of 1739 Finnish men and women, a two-way relationship between neuroticism – but not with extraversion – and depressive symptoms was found over 15 years with four follow-up waves (Elovainio et al., 2014).

Taken together, these findings suggest that from the five major personality traits, neuroticism is clearly a vulnerability factor for depressive and anxiety disorders (Jeronimus et al., 2016; Kotov et al., 2010b). In addition, individuals studies have shown that neuroticism enhances the impact of negative life events on mental health problems (Riese et al., 2014), supporting the vulnerability model. Importantly, both personality traits and mental disorders have been shown to be moderately heritable (*for more see chapter 19 in this book*) (Polderman et al., 2015), although there is some heterogeneity in the heritability of the mental disorders. A number of twin studies – and more recently studies using genome-wide association data – have shown that neuroticism and mental disorders share same genetic background (Kendler et al., 2006). The genetic correlation between neuroticism and depression has been estimated to be considerably higher than that between neuroticism and thought disorders (Smith et al., 2016). For example, genetic factors explained around half of the association between neuroticism and internalizing disorders indicating that

common environmental factors may have a less marked role in explaining association between personality and mental disorders. For other personality traits, there is also evidence of common determinants for personality and mental disorder. For example, low childhood socioeconomic position have been associated with low extraversion and low conscientiousness in adulthood (Sutin, Luchetti, Stephan, Robins, & Terracciano, 2017). Again, these associations are considerable weaker than those between personality and mental disorder. In sum, the etiology of personality trait neuroticism and mental disorders appears to share common determinants, supporting the Common cause model.

The association between depressive symptoms and future personality trait change supports both the scar and complication models. Whereas some individual clinical studies have found support for the scar hypothesis (Rosenström et al., 2015), others have not (Ormel, Oldehinkel, & Vollebergh, 2004). Thus, it seems that there is a two-way relationship between depressive symptoms and neuroticism, but it remains unclear whether chances demonstrated in neuroticism are permanent or not.

Finally, shared underlying processes have been associated with neuroticism and depressive disorders, which can be seen as support for the spectrum model (Jeronimus et al., 2016). Nonetheless, it is unlikely that spectrum model can be seen as the dominant explanatory model as it cannot explain the bidirectional association between personality and mental disorders, and it has also been criticized also due to statistical reasons (Durbin & Hicks, 2014).

Substance abuse

From the substance abuse disorders, the role of personality has been hypothesized and examined especially in alcohol consumption and smoking. In a largest meta-analysis up to date (Kotov et al., 2010b), individuals with substance abuse disorder are characterized by high neuroticism ($r = 0.36$) and low conscientiousness ($r = -0.44$), which are in line with the findings between personality traits

with anxiety and depressive disorders. Whereas agreeableness was found to be also low among individuals with substance abuse disorder (r = -0.27), extraversion and openness to experience were not found to be associated with substance abuse disorders (Kotov et al., 2010b). The associations between personality traits and substance use disorders were slightly stronger for mixed substance use disorders, which included both alcohol and drug use diagnoses (e.g., the correlation between neuroticism and alcohol use disorder was 0.28, whereas the correlation between neuroticism and mixed substance use disorder was 0.42).

From the studies examining the role of personality traits in smoking, a meta-analysis of nine published cross-sectional studies with over 4500 participants demonstrated that smokers are characterized by higher neuroticism, lower agreeableness and lower conscientiousness (Malouff, Thorsteinsson, & Schutte, 2006). In a meta-analysis of 20 studies with over 7,500 participants, alcohol consumption was higher in individuals with low conscientiousness, low agreeableness, and high neuroticism (Malouff, Thorsteinsson, Rooke, & Schutte, 2007). These two literature-based meta-analysis suggest that the associations between personality traits with smoking and alcohol consumption are similar in terms three personality traits, i.e., neuroticism, agreeableness, and conscientiousness. However, these meta-analyses are rather small-in-scale and they included also both clinical and community samples.

More recently, large scale population based cohort studies have also been conducted on personality and substance abuse, mainly smoking and high alcohol consumption. Recently, Hakulinen and his colleagues (2015) examined the association between the Big Five personality traits and smoking behaviors in a large-scale meta-analysis using individual participant design with nine mainly population based cohort studies (n = 80 000). The study demonstrated that (1) smokers were characterized by higher neuroticism and lower conscientiousness, (2) higher neuroticism and lower conscientiousness were associated with smoking initiation, and (3) lower neuroticism predicted higher probability of smoking cessation among those participants who smoked at the

baseline (Hakulinen, Hintsanen, et al., 2015). Moreover, individuals who had quit smoking had lower levels of agreeableness (Hakulinen, Hintsanen, et al., 2015).

In another individual-participant meta-analysis using similar design, heavy alcohol users were characterized by high extraversion, high neuroticism, log agreeableness and low conscientiousness when compared to moderate alcohol users in a cross-sectional analyses (Hakulinen, Elovainio, Batty, et al., 2015). In addition, individuals who abstained from alcohol use were characterized by low extraversion, high agreeableness, and low openness to experience. In the longitudinal analyses, however, only high extraversion and low conscientiousness were associated with increased risk of transitioning from moderate to heavy alcohol consumption follow-up. Moreover, low extraversion, high agreeableness and low openness to experience were associated high higher probability transitioning from moderate to abstinence over time.

Taken together, individuals with substance use disorders are mainly characterized by high neuroticism, low agreeableness and low conscientiousness. Although in general these findings support the notion that at least high neuroticism is a vulnerability factor for substance abuse disorders, there is clearly a lack of longitudinal studies that would have examined reciprocal associations between personality traits and substance abuse. From individual studies, a study using the Minnesota Twin Family Study data showed that young adults who had an alcohol use disorder demonstrated a lower normative decline in neuroticism over time (Hicks, Durbin, Blonigen, Iacono, & McGue, 2012), which supports the scar and co-development models. More recently, pooled analysis of six cohort studies with over 35 000 demonstrated that high alcohol use (measured as average alcohol consumption, frequency of binge drinking, and symptoms of alcohol use disorder) was associated with increasing extraversion and neuroticism, and also decreasing agreeableness and conscientiousness, over two measurement point (Hakulinen & Jokela, 2018). The associations were mostly robust across different measures of alcohol use and across studies from different countries suggesting for that alcohol use is associated with change in personality traits. In sum, the

association between alcohol use and personality traits is very likely to be reciprocal, and it can be hypothesized that this reciprocity starts already for most individuals at early adulthood.

Schizophrenia and other psychoses

Traditionally, individuals suffering from schizophrenia have been described as lacking emotion and capacity for hedonic experiences, and prone to experience negative emotions. In addition, it has been hypothesized that individuals with schizophrenia had abnormal personalities before the onset of the actual disease (Andersen & Bienvenu, 2011). Studies examining associations between more severe mental disorders – mainly schizophrenia – have produced quite similar findings than studies examining the association between personality with common mental disorders. In a recent systematic meta-analysis with 460 patients with schizophrenia and 486 healthy subjects from nine studies, patients with schizophrenia had higher neuroticism, lower extraversion, lower consciousness, lower agreeableness and lower openness (Ohi et al., 2016). Effect sizes were large for neuroticism and extraversion, and moderate for other traits.

There are some longitudinal studies that have examined relationship between premorbid personality and schizophrenia or other psychoses. In a register based study of over 200,000 Finnish military conscripts, Lönnqvist and colleagues (Lönnqvist et al., 2009) found that high neuroticism and low extraversion predicted onset of schizophrenia, but that the association between extraversion and schizophrenia diminished considerably when the statistical models where adjusted for general intelligence. Recently, similar finding was done in Swedish registry study where 1 million men were followed from late adolescence to adulthood; high neuroticism and low extraversion were associated with increased risk of schizophrenia and other psychosis (Hayes, Osborn, Lewis, Dalman, & Lundin, 2017). Interestingly, the association between extraversion with bipolar disorder was more nuanced, both high and low extraversion being risk factors for incidence of bipolar disorder (Hayes et al., 2017). Van Os and Jones (Van Os & Jones, 2001) showed in a

birth cohort study of over 5362 men and women that high neuroticism and low extraversion measured at the age of 16 years predicted the later risk of schizophrenia when symptoms of anxiety and depression where taken into account. Similarly, in two another prospective studies the association between neuroticism with schizophrenia has also been shown (Bogren et al., 2010; Krabbendam et al., 2002), indicating that premorbid neuroticism is a risk factor for future schizophrenia.

Multiple studies of personality change due to schizophrenia has also been conducted. The hypothesis in this line of research has been that onset of schizophrenia *scars* personality over time. A review of these studies concluded that although there is evidence for scar effects in schizophrenia, studies have also shown that there are common factors for both abnormal personality and schizophrenia (Andersen & Bienvenu, 2011). In addition, high agreeableness and low conscientiousness are likely to alter the course of schizophrenia (Andersen & Bienvenu, 2011). More recent clinical studies have, however, indicated that personality trait stability in individuals suffering from psychotic disorders are similar to healthy individuals (Boyette, Nederlof, Meijer, de Boer, & de Haan, 2015).

In sum, the association between personality traits and schizophrenia may be reciprocal. High neuroticism and low extraversion can be regarded as vulnerability factors for schizophrenia, and it also seems that onset of schizophrenia modifies many, if not all, personality traits. It must be, however, noted that there is a lack of large scale studies that would have included measures of psychosis continuum, and thus it remains unclear whether similar effects can be found for other psychosis diagnoses than schizophrenia.

Attention deficit hyperactive disorder (ADHD)

ADHD is a mental disorder characterized by deficits in attention and symptoms of hyperactivity/impulsivity. Although these domains are often put together, studies typically examine

these symptoms also separately. In a meta-analysis of up to 40 studies, high neuroticism, low agreeableness and low conscientiousness were associated with both domains of ADHD (Gomez & Corr, 2014). However, these associations were considerably stronger for the domain of inattention than for hyperactivity/impulsivity. These findings are in line with the spectrum model where ADHD can be seen as the endpoint of personality trait continuum. In addition, these findings also partly support the vulnerability model where personality traits can be seen as a risk factor for developing ADHD. There are, however, no longitudinal studies where possible scar or state effects would have been examined and thus it remains unclear what the prospective associations between personality traits and ADHD would look like.

Eating disorders

Eating disorders refers to a set of disorders that are characterized by irregular eating habits and concern or distress about body weight or shape. Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder are the most common eating disorders and they affect both men and women. Personality traits have been hypothesized to influence the onset, expressions of symptoms, and maintenance of eating disorders. Up to date, two narrative literature reviews have reviewed studies that examined the association between personality traits and eating disorders (Cassin & Von Ranson, 2005; Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006). Although there are a number of studies where he association between Big Five personality traits and eating disorders have been examined, most of the studies on the topic have examined more narrow personality trait, such as perfectionism or drive for thinness (Cassin & Von Ranson, 2005; Lilenfeld et al., 2006). In addition, there are very few longitudinal studies and most cross-sectional studies are small in-scale (Cassin & Von Ranson, 2005). However, at least high neuroticism, low conscientiousness, and low agreeableness are associated with eating disorders (Cassin & Von Ranson, 2005; Lilenfeld et al., 2006), and thus traits can be considered as vulnerability factors. It is also likely that onset of an

eating disorder will affect personality trait development (Lilenfeld et al., 2006), and thus have a scar or a state effect on personality traits, but more research on this topic is needed.

Implications and future directions

The above-reviewed evidence clearly demonstrates that from the five major personality traits, neuroticism is a risk or vulnerability factor for future mental disorders. The findings are consistent across clinical studies and cohort studies using clinical interviews or different types of symptom measures. Thus, it may be argued that neuroticism is a central element of general factor of psychopathology that has been shown to explain comorbidity between different mental disorders (Caspi et al., 2014; Lahey et al., 2012). Although it seems that these associations are stronger for depressive, anxiety and substance abuse disorders than for schizophrenia and other psychoses, information of neuroticism cannot be used to distingue disorders from one another.

From the other personality traits, low conscientiousness was associated with most of the mental disorders, but the strength of the association is considerably weaker than that between neuroticism and mental disorders. Thus, low conscientiousness can be characterized also as vulnerability factor of mental disorders. In addition, low conscientiousness has emerged as the only major personality trait that is consistently associated with poor physical health outcomes (Bogg & Roberts, 2004; Jokela, Elovainio, et al., 2014; Jokela, Pulkki-Råback, Elovainio, & Kivimäki, 2014) and all-cause mortality (Jokela et al., 2013). Thus, low conscientiousness may be considered as an overall risk factor for poor physical and mental health.

Regarding extraversion, individuals suffering from depressive or anxiety disorders seems to be characterized by low extraversion. Although low extraversion is associated with future anxiety or depression, these associations considerably dilute when baseline depression or anxiety is taken into account. In addition, and contrary to these findings, low extraversion is not associated with substance abuse disorders, but high extraversion is associated with current substance abuse in

prospective cohort studies. Thus, association between extraversion and substance abuse seems to be mixed. Low agreeableness, in turn, is associated only with substance use disorders and alcohol consumption, but not with major mental disorders. Last, current evidence clearly demonstrates that openness to experience is not associated with mental disorders.

Recently, a meta synthesis study that combined 30 meta-analyses with over 500 000 participants, suggests that the association between the Big Five personality traits is larger when examining outcomes related to mental health than when examining outcomes related to physical health or health-related behaviors (Strickhouser, Zell, & Krizan, 2017). The average reported correlation between individual Big Five personality traits and mental health outcomes were 0.11 for extraversion, 0.27 for neuroticism, 0.21 for agreeableness, 0.22 for consciousness, and 0.06 for openness to experience. These findings, with the individual studies and meta-analyses reviewed earlier, suggest that the effect size between personality traits and mental health related outcomes is from weak to moderate.

Regarding practical utility of the Big Five personality models, it must be noted that although Big Five personality inventories are commonly used by psychologist in their clinical practice, they are not used by doctors or another health professional in primary care or other day-to-day health care facilities. However, some studies suggest that Big Five personality model may be useful in defining normal and abnormal personality functioning and it has been shown that the Big Five is useful in clinical practice. Whether the Big Five personality model will land in clinical practice remains to be seen. In addition, there is some evidence that so-called personality tailored interventions could be useful as part of precision medicine approaches. For example, interventions for alcohol and drug misuse may be more effective when targeted at individuals with certain personality dispositions (Conrod, Castellanos-Ryan, & Mackie, 2011). Thus, information on personality may contribute to optimal allocation of prevention and treatment resources, but more studies on this topic is definitely needed.

New cross-sectional studies are unlikely provide more understanding of the personality-mental disorders association. Longitudinal studies with several repeated measurements, however, are still needed to examine the dynamic relationship between personality and mental disorders. It is also likely that the associations between personality and mental disorders could vary in subpopulations. For example, recent study using large sample of adults from the USA showed that the association between neuroticism with mental health problems was amplified among individuals with physical limitations, social problems and low socioeconomic status (Vittengl, 2017). Studies using family-designs are also needed to better untangle the common environmental and genetic architecture of personality and mental disorders. Recent genome wide-association studies have identified a number of different genetic loci for different personality traits, and especially for neuroticism (*see chapter 19 in this book*). Thus, studies using genetic information for studying causality in observational studies are likely to provide new information about the relationship, and possible causality, between personality traits and mental disorders.

A further important aspect of personality-mental disorders research are studies that examine the role of personality traits in recovery from mental disorders. In recent large scale meta-analysis of over 200 studies, personality traits were found to change over the course of intervention (Roberts et al., 2017). Whereas largest effect sizes were found for decreasing neuroticism (Cohen's d = 0.57) and increasing extraversion (Cohen's d = 0.23) and conscientiousness (Cohen's d = 0.19), little difference between the type of intervention (e.g., pharmacotherapy) (Roberts et al., 2017). This indicates that all kind of interventions in general produce a positive effect of personality, and it also highlights how psychological interventions such as psychotherapy can be seen as tools of changing those side of personality that likely cause distress and problems for the individual. This being said, studies where change in major personality traits – or in more specific facets of personality traits – are needed for better understanding how personality patterns change due to course of an intervention.

Conclusion

The role of personality in mental disorders have been hypothesized for a long time. Current evidence shows that major personality traits – describing inter-individual differences in behavior, thoughts, and emotions – may be important in terms of mental health. From the major personality traits, associations between neuroticism with mental health have received consistent support. Neuroticism can be seen as a risk factor (or a vulnerability factor) for poor mental health and this vulnerability can materialize through interactions between person and environment. For example, individuals high on neuroticism may have more prolonged and intensive reactions of negative life events. It is also clear that the etiology of neuroticism and mental disorders is partly overlapping. From the other personality traits, associations between low conscientiousness and poor mental health is consistently found. This association is, however, considerably weaker than with neuroticism and mental disorders.

This review reflects current status of literature. Further research on the relationship between personality traits and mental disorders may complement the picture by examining how personality traits and mental disorders are related over the life course.

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Table 1. Major theoretical models explaining the association between personality and mental disorders

Model	**Explanation**
Vulnerability	Personality traits represent a risk or contributing factor for the onset of mental disorder
Common cause	Common factors explain the association between personality traits and disorders
Spectrum	Similar etiology and the association is fairly specific and also non-linear
Scar	Mental disorders cause persistent changes in personality traits
State	Mental disorders cause temporary changes in personality traits
Co-development	Personality traits and mental disorders develop together